KENWOOD

HI/FI STEREO COMPONENTS

SERVICE MANUAL

L-05M

HIGH SPEED DC AMPLIFIER

128

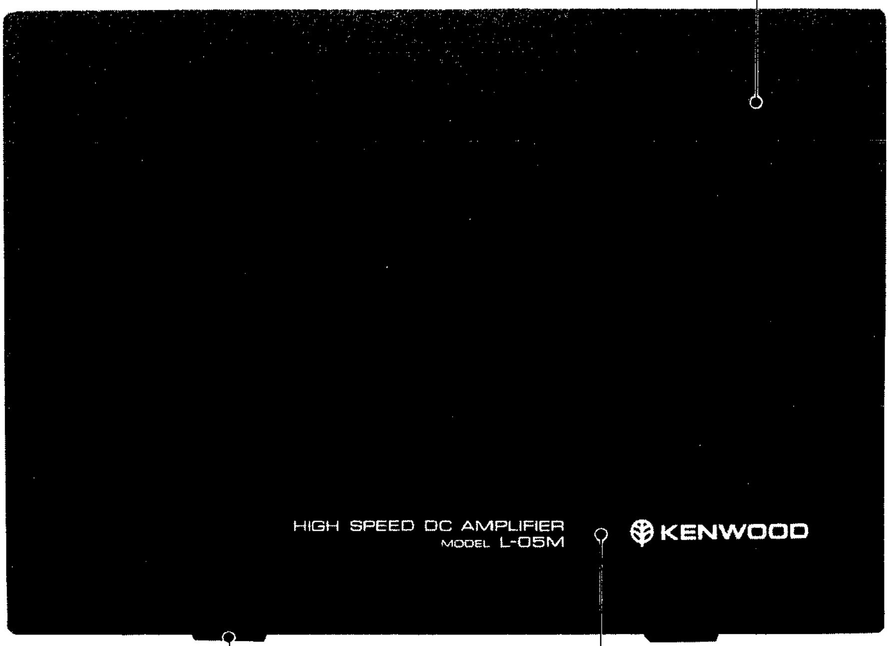
CONTENTS

Note:
The products are subject to modification in components and circuits in different countries and regions. This is because each product must be used under the best condition. This manual provides information of modification based on the standard in the U.S.A. for the convenience of ordering associated components and parts.

U.S.A.	K
Canada	P
PX	U
Australia	X
Europe	W
England	T
Scandinavia	L
South Africa	S
Other Areas	M

EXTERNAL VIEW

Panel ass'y*



Foot*

LED*

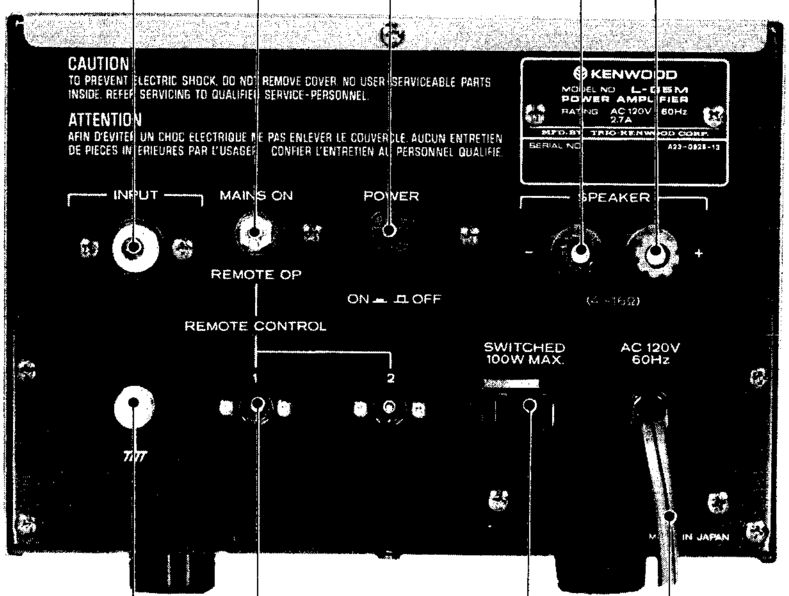
Toggle sw.
(S44-2022-05)

Phono jack
(E13-0115-05)

Knob
(K29-0294-04)

Binding post (BLK)
(E21-0005-15)

Binding post (RED)
(E21-0004-15)



Binding post (GND)
(E21-0007-05)

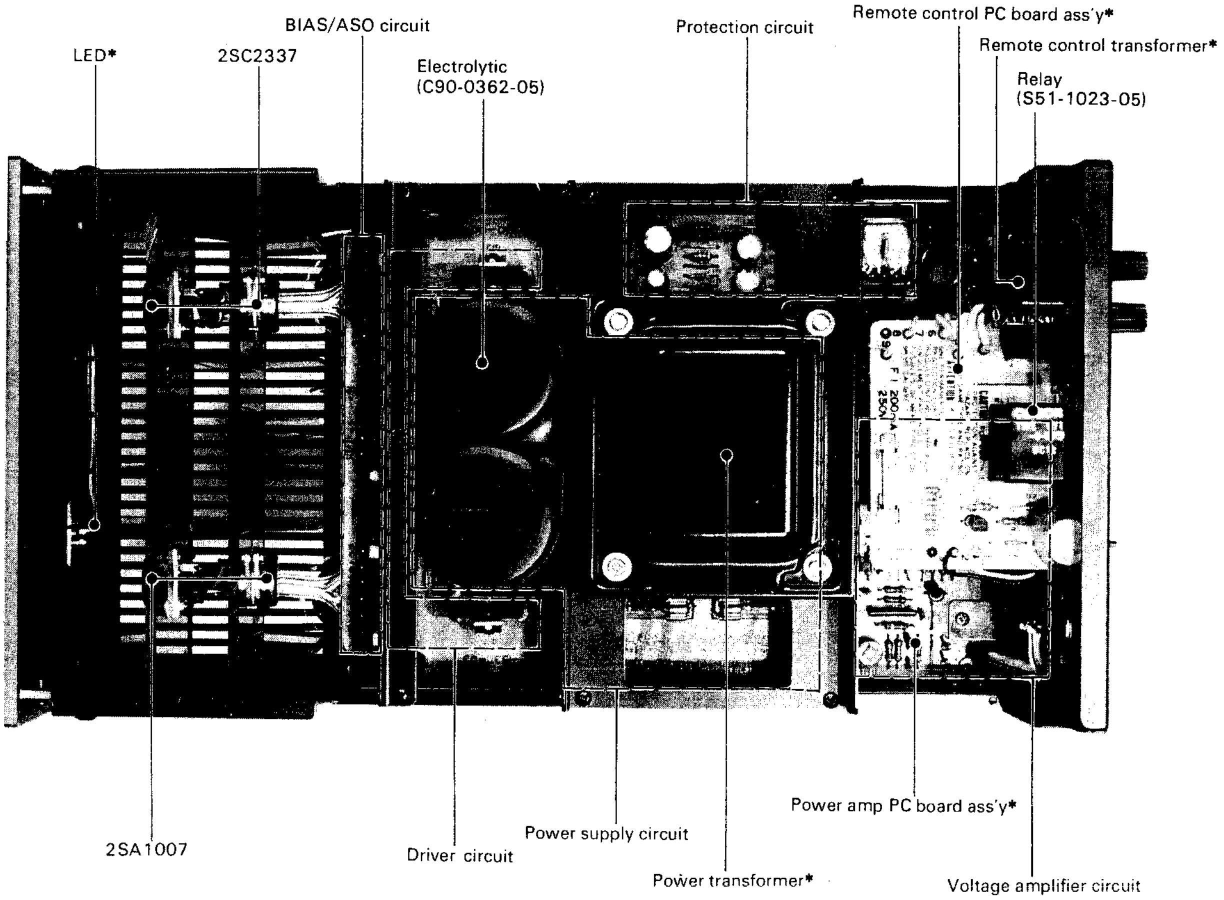
Remote jack
(E03-0006-05)

AC outlet*

Power cord*

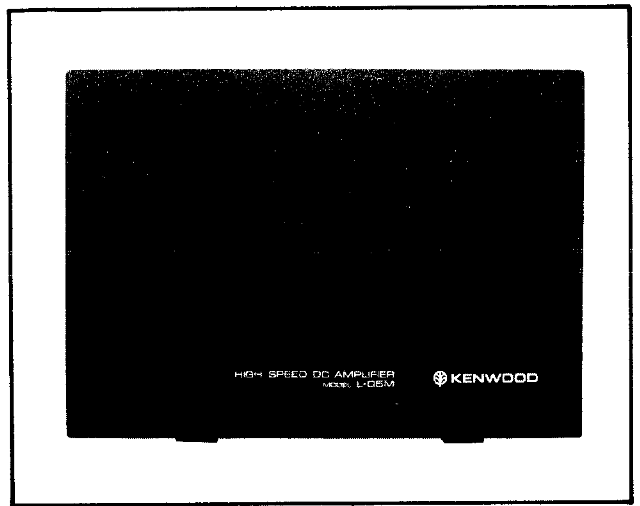
*Refer to Destinations' Parts List.

INTERNAL VIEW



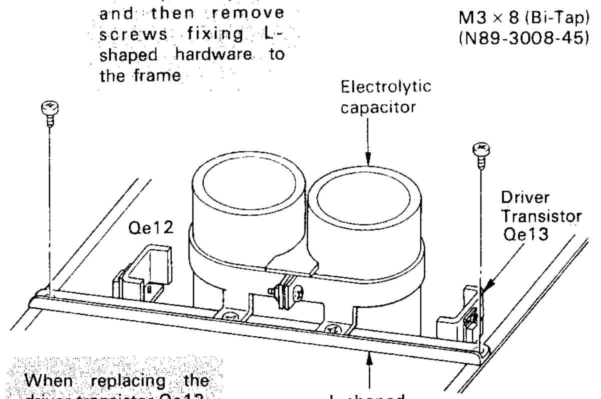
* Refer to Destinations' Parts List.

DISASSEMBLY FOR REPAIR

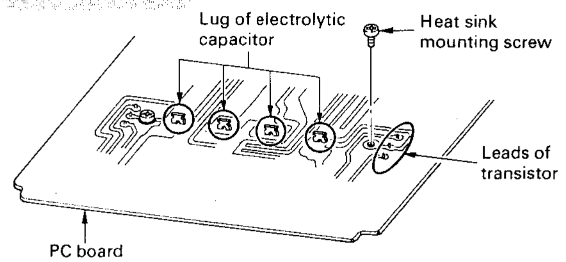


ELECTROLYTIC/DRIVER TRANSISTOR

When replacing the electrolytic capacitor, unsolder the lug of the electrolytic capacitor and then remove screws fixing L-shaped hardware to the frame

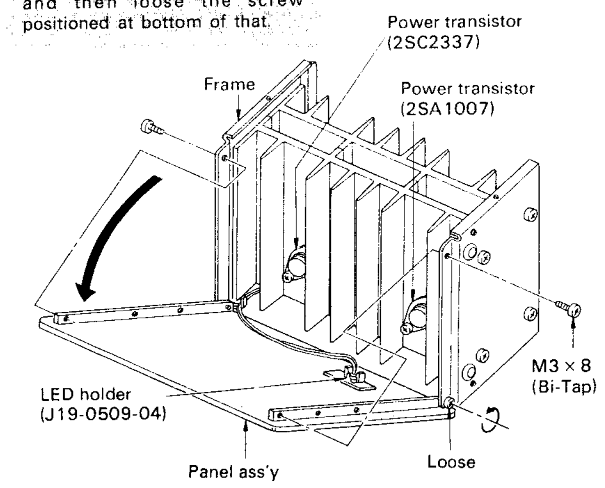


When replacing the driver transistor Qe12, 13, unsolder the leads of transistor and remove the screw fixing the transistor to PC board.



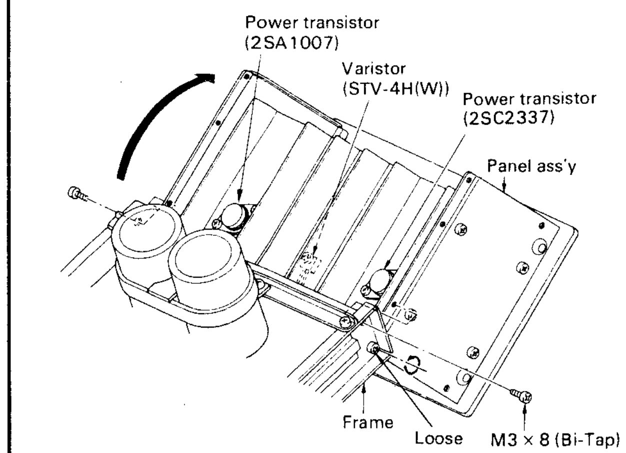
POWER TRANSISTOR (1)

When replacing the power transistor for located near the panel ass'y, remove the screw positioned at the top of the panel ass'y and then loose the screw positioned at bottom of that.

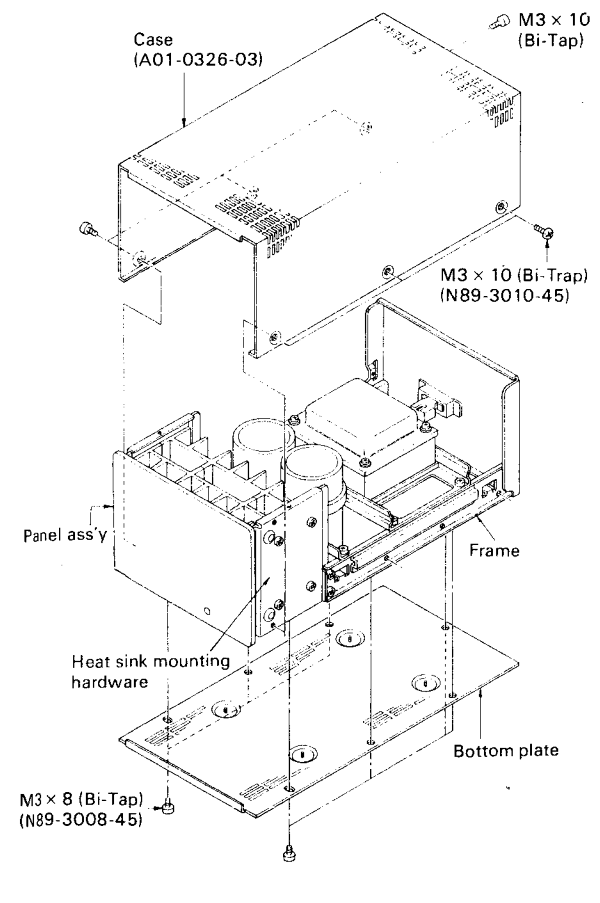


POWER TRANSISTOR (2)

When replacing the power transistor located near the electrolytic capacitor, remove the screw positioned at the top of frame, and then loose the screw positioned at bottom of that.

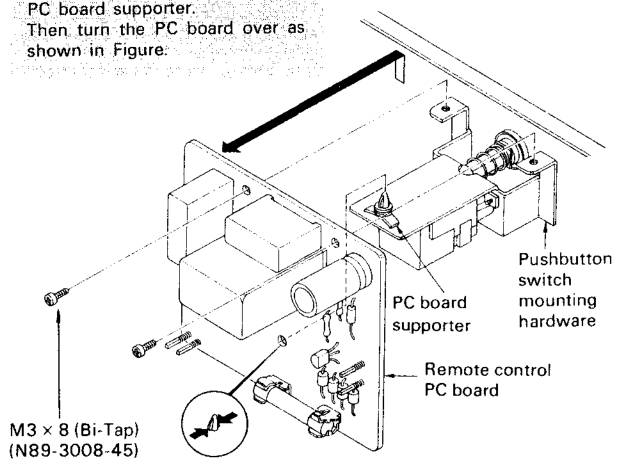


BOTTOM PLATE/CASE

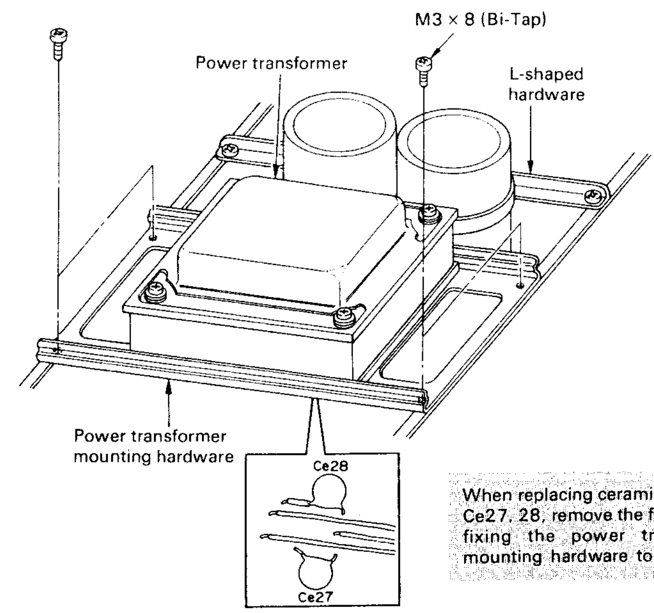


REMOTE CONTROL

When removing the remote control PC board ass'y from pushbutton switch mounting hardware, first unscrew the screws fixing PC board to the mounting hardware and then push the protrusion of PC board supporter.
Then turn the PC board over as shown in Figure.

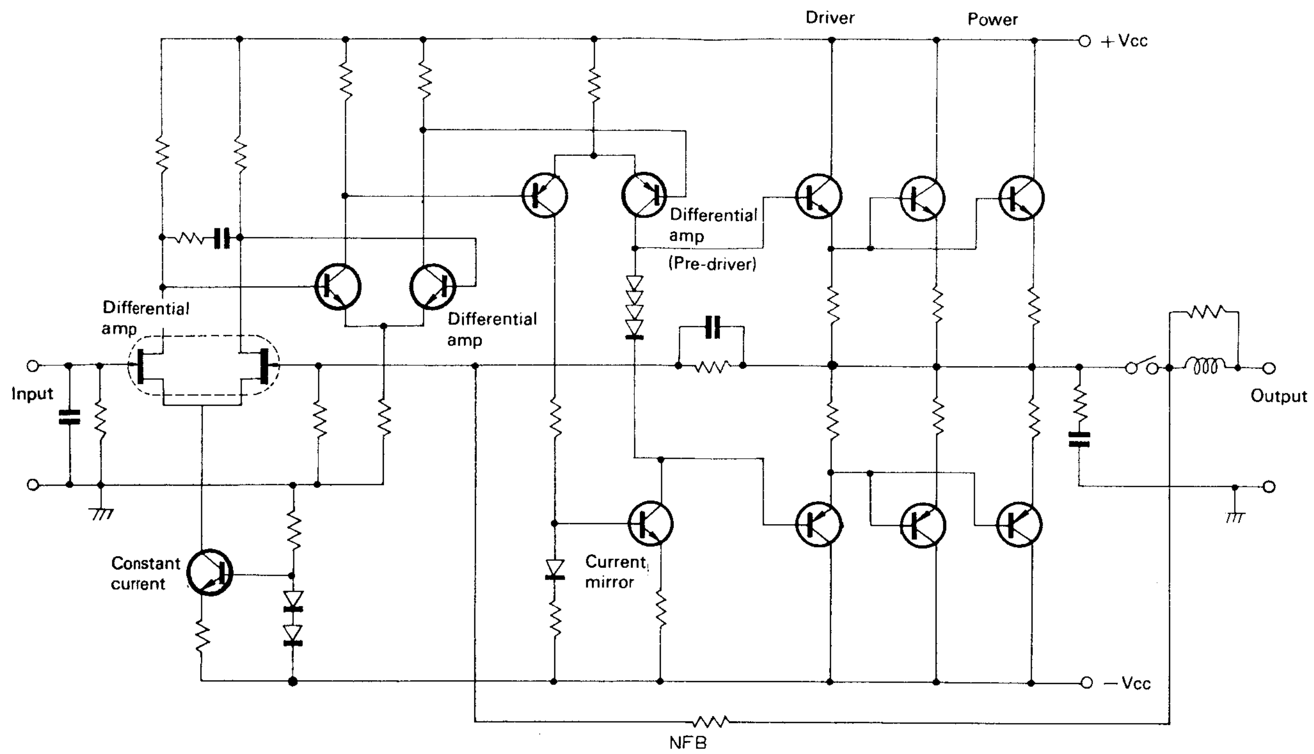


POWER TRANSFORMER



When replacing ceramic capacitor Ce27, 28, remove the four screws fixing the power transformer mounting hardware to frame.

BLOCK DIAGRAM / CIRCUIT DESCRIPTION



〈 **Block Diagram of L-05M** 〉

CIRCUIT CONFIGURATION

The voltage amplifier circuit shown in the above diagram consists of 3-stage differential amplifier, the input stage uses dual FET to suppress ΔV_{GS} and is driven by constant current to improve CMRR. Unlike AC amplifiers having time constant of low frequency range in NF loop, DC amplifier does not produce a full (100%) DC feedback and, hence, it has a problem of offset voltage due to temperature drift.

However, this amplifier incorporates highly reliable, packaged type dual FET that provides excellent thermal balance. In addition, it uses high quality, metal glazed semi-fixed resistors for adjusting offset. The offset voltage has been adjusted to zero, and its variation is as small as ±20 mV even when the temperature of thermostatic chamber is varies from −10°C to +60°C.

The amplifier also features low noise operation; the signal-to-Noise ratio is as high as 120 dB (IHF-A).

The input stage is specifically designed since the current flowing into this stage greatly affects S/N, temperature drift, slewing rate, etc.

The third stage differential amplifier employs a current mirror circuit as a load for the predriver to obtain a sufficient gain. It operates as a kind of push-pull circuit to eliminate the even-harmonics distorsion. Since both the positive and negative half cycles of the signal are driven by the same impedance, the plus and minus waveforms in transient time are kept balanced, thus providing excellent output waveforms.

The current amplifier is composed of a 2-stage Darlington circuit. The output stage is connected in paralled with a well-complemented characteristic EBT to serve as a 100W monaural amplifier.

Since the signal passes through the speaker protection relay, the contacts of the relay are gold plated. This relay has 4 contacts which are connected in parallel to improve poor contact.

The L-05M contains a Multi-feedback circuit besides a common NF loop. This circuit prevents the deterioration of characteristics due to the impedance of the relay and the foil pattern.

The phase compensating coil in the output stage uses a thick and short sized wire to minimize the impedance and improve the amplifier characteistics and damping factor in high frequency range.

HIGH SPEED AMPLIFIER

In audio amplifiers, noise, harmonic distortion and cross talk must be minimized to ensure high fidelity reproduction. This can be attained by improving the circuits and electronic parts. Especially, parts layout and foil pattern techniques are important factors to determine the performance of amplifier.

CIRCUIT DESCRIPTION

The L-05M employs a special parts layout and foil pattern to completely eliminate internal channel interferences over the entire frequency range and minimize phase compensation in high-frequency range, thus assuring high gain and improving harmonic distortion even in the super high-frequency range. The transient response is also improved to minimize waveform distortion.

When a square-wave input is applied to an amplifier, the signal waveform at the output is not almost the same as the input waveform. This phenomenon is apparent especially when the input signal rises rapidly, and it is not a few found in every amplifier, even in the best type.

Accordingly, an amplifier having excellent follow-up characteristics is desirable, and such an amplifier is generally called the high speed amplifier. The follow-up ability is represented by a rise time or slewing rate. We call it "transient response" collectively.

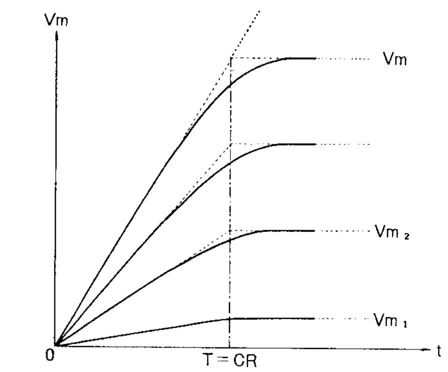


Fig. 1. Rising Charactaristic of Amplifier Having Constant Rise Time

RISE TIME

If a square-wave signal is applied to an amplifier and its level is changed, a rising characteristic having a same time constant is obtained (see Fig. 1). This characteristic shows the exponential curve $V = V_m(1 - e^{-\frac{t}{CR}})$ as is found when a step signal is applied to an integrating circuit. The rise time is limited by this curve since the amplifier has a time constant circuit which is related to the frequencies of small signals.

Rise Time

Before explanating the rise time for L-05M, the rising and falling characteristics of waveforms are explained below.

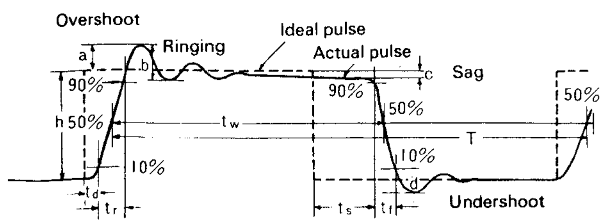


Fig. 2. Pulse Waveform

Referring to Fig. 2, the broken line shows an ideal square waveform and the solid line shows an actual pulse waveform. In the actual pulse the waveform appears later. It does not rise rapidly to the height "h" of the ideal pulse, but does not keep "h" and also rises gradually above "h" where it produces waves and then falls down below "h". Fianlly, the actual pulse falls gradually reaches "0" even when the ideal pulse disappears.

The process of the rising of pulse is called "rising" and that of the falling is called "falling".

Since the ideal pulse is deviated from the actual pulse, 10 ~ 90% of the height "h" of the ideal pulse is called the rising and falling characteristics.

Symbol	Item	Definition
t_d	Delay time	Time necessary for the actual pulse to rise to 10% of height "h" of the pulse. Or time from the instant at which a signal is applied to the circuit to the period at which the circuit starts operation. In other words, it is a time necessary for the pulse to pass through the circuit.
t_r	Rise time	Time necessary for the actual pulse to rise from 10% to 90% of the height "h" of the ideal pulse, or the operating speed of the circuit which is determined by frequencies.
t_s	Storage time	Time necessary for the actual pulse to fall down at 90% of the height "h" of the ideal pulse, or time at which the circuit stops operating. This is the time required to discharge the electric charge stored in a transistor.
t_f	Fall time	Time necessary for the actual pulse to fall down from 90% to 10% of the height "h" of the ideal pulse which is determined by frequencies. Since circuits have non-linear characteristic, the rising and falling characteristics require different conditions and, hence, the rise time differs from the fall time.
t_w	Half width	Pulse width used for the time at which the height "h" of the pulse is more than 50%.
a	Overshoot	A portion of waveform above the expected height "h" of one.
b	Ringing	Unstabilized portion of waveform measured between peaks. This occurs when the circuit resonates with high frequencies.
c	Sag (or zag)	A falling portion of waveform which is below the height "h" of the ideal pulse. This occurs when the circuit shuts off low frequencies and DC components.
d	Undershoot	A portion of waveform below the "0" line.

Note: The parameter of a~b is represented by % to the height "h" of waveform.

CIRCUIT DESCRIPTION

RISE TIME FOR L-05M

The rise time means the time required for the output voltage waveform to rise from 10% to 90% at 8-ohm load. In the case of audio signals, the input is not turned on and off when measuring the rise time as is done with transistors since plus and minus inputs should be taken into consideration in measurement. So, the rise time is expressed by the pulse rise time and minus rise time.

In the plus rise time (Fig. 3), if a square wave signal is applied to an integrating circuit composed of RC, the output is obtained from the following formulas:

$$V = Vm\,(1 - e^{-\frac{t}{CR}}) \quad \cdots\cdots (1)$$

$$V_1/Vm = 0.1 = 1 - e^{-\frac{t_1}{CR}} \quad \cdots\cdots (2)$$

V_1 is voltage at t_1.

$$V_2/Vm = 0.9 = 1 - e^{-\frac{t_2}{CR}} \quad \cdots\cdots (3)$$

V_2 is voltage at t_2.

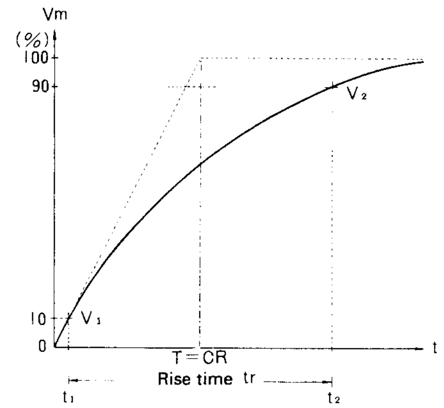


Fig. 3 Rise Time (tr)

If the rise time is expressed by "tr" ($tr = t_2 - t_1$), the following formulas are established from (2) and (3).

$$tr = 2.3CR - 0.1CR = 2.2CR \quad \cdots\cdots (4)$$

$$f = 1/2\pi CR$$

$$tr = 0.35/f \quad \cdots\cdots (5)$$

The "f" is the cutoff frequency of high range determined by the time constant of CR, which is a frequency −3 dB below the frequency characteristic at a small signal.

Accordingly, the rise time can be reduced by designing the cutoff frequency of the amplifier to be high.

The cutoff frequency of L-05M is 600 kHz, so the rise time obtained from the formula (5) is 0.55 μs.

If the input signal has a rise time of "tr_1", the output of amplifier having a rise time of "tr_2" becomes $tr = tr_1 + tr_2$. Therefore, accurate measurement is not possible unless the rise time "tr_1" of the input signal is 1/5 to 1/10 of "tr_2".

In conventional amplifiers, the plus rise time differs from the minus rise time. Generally, the rise time of these amplifiers is about 1.5 μs to 6 μs.

In the L-05M, the rise time in plus and minus directions are the same, providing excellent waveforms free from ringing. This amplifier is also designed for high speed operation.

Fig. 4 shows an input waveform whose rise time is as quick as 10 ns and Fig. 5 shows the rising characteristic with the input level attenuated and the output of L-05M maintained at 2 Vp-p.

The rise time was also measured at the outputs of 40 Vp-p and 80 Vp-p. In either case, the measured rise time keeps 0.55 μs on.

In other amplifiers, the rise time at the output shows 0.4 μs but the waveform containes a ringing.

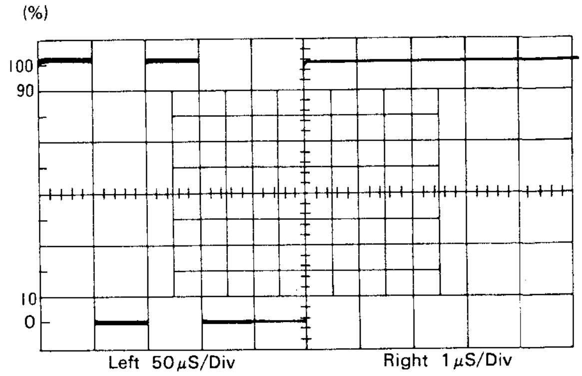


Fig. 4 Input Waveform of L-05M (Rise Time: 10nS)

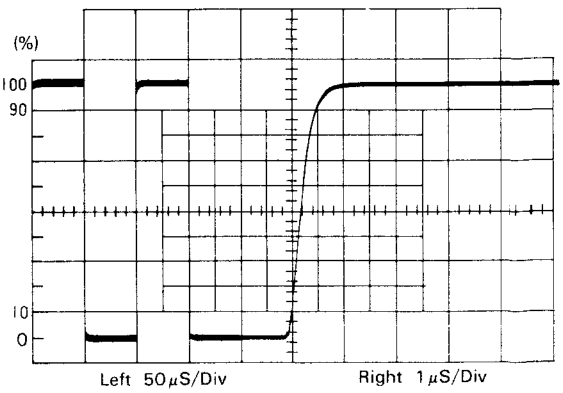


Fig. 5 Rising Characteristic of L-05M at Small Output (2 Vp-p)

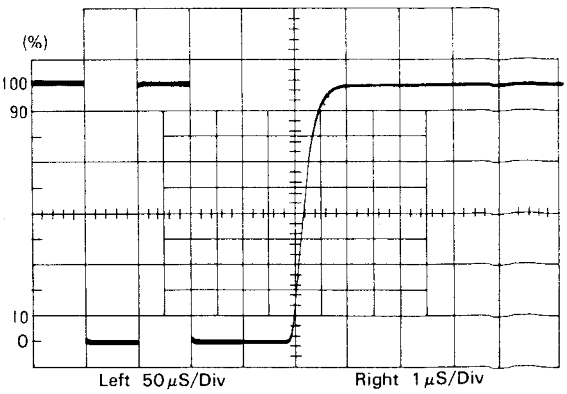


Fig. 6 Rising Characteristic of L-05M at Medium Output (40 Vp-p)

CIRCUIT DESCRIPTION

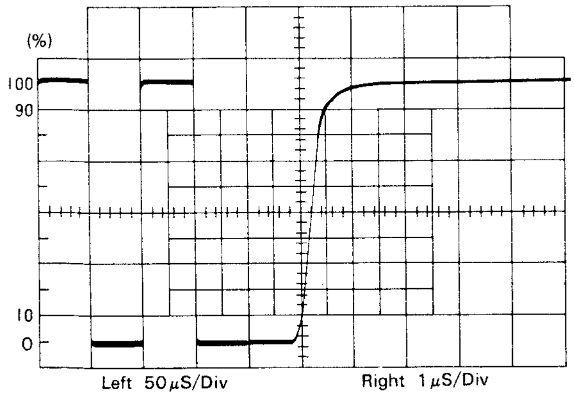


Fig. 7 Rising Characteristic of L-05M at Large Output (80 Vp-p)

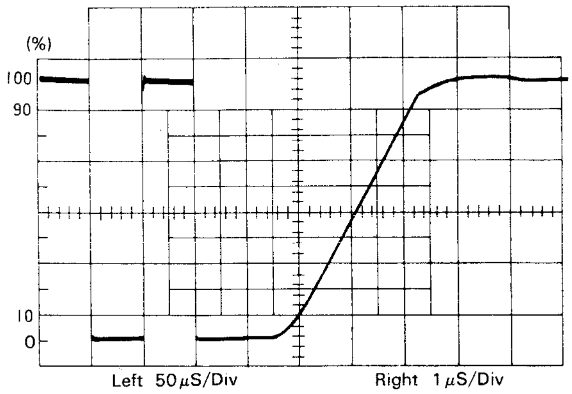


Fig. 10 Rising Charact eristic of Other Wide Band Amplifiers at Large Output (80 Vp-p)

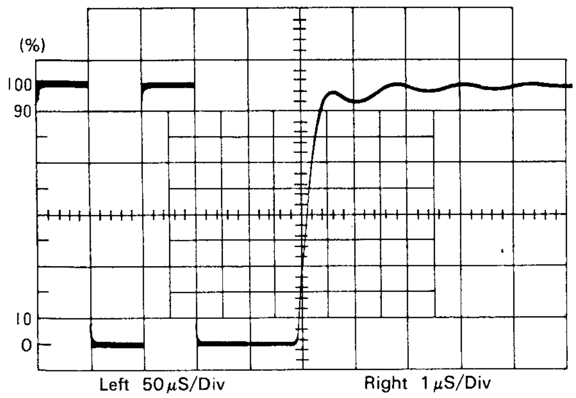


Fig. 8 Rising Characteristics of Other Wide Band Amplifiers at Small Output (2 Vp-p)

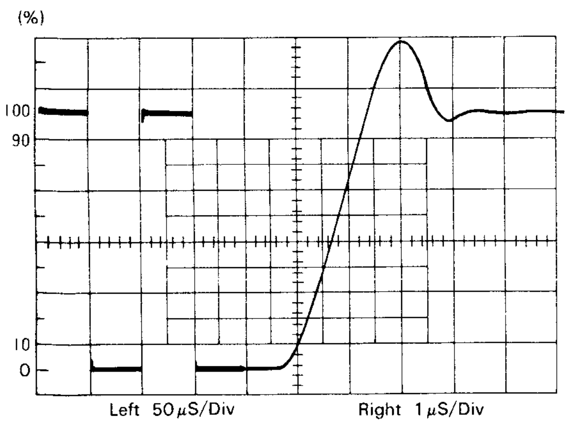


Fig. 9 Rising Characteristic of Other Wide Band Amplifiers at Medium Output (40 Vp-p)

As shown in the above figures, a large overshoot is noticed at 40 Vp-p and the rise time grows late to 1.2 μs as compared with that at 2 Vp-p.

Moreover, when the output is increased, the power voltage is saturated and the overshoot in the output is decreased, at which the rise time also grows late to 2.2 μs.

The amplifiers which were tested have a short rise time at small outputs and therefore the frequency range is very wide; however, when the level is increased, the rise time is increased because it reaches rapidly the slewing rate region.

That the rise time is not varied appreciably when the input is increased until the output voltage is saturated, means that the frequency response remains the same even at a small or large amplitude. In conventional amplifiers, the cutoff frequency is introduced into low frequencies at a large amplitude and thus the rise time which is fast at a small output becomes late at a large output.

The fall of frequency response at a large amplitude depends on the slewing rate of the circuit and the high frequency characteristic of power transistors.

The L-05M uses high speed transistors (EBT) and is designed to improve the slewing rate of the circuit.

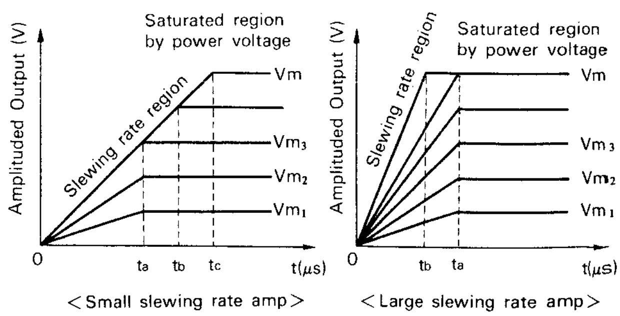


Fig. 11 The Rise Time of Amplifier with Small and Large Slewing Rate

CIRCUIT DESCRIPTION

SLEWING RATE

Both the frequency band width and the slewing rate are important factors when handling quick rising pulses and large-amplitude high frequency outputs.

When the input signal has a waveform A (Fig. 12), the output produces a waveform B which rises along a specific curve. This rise time is normally measured in V/μs.

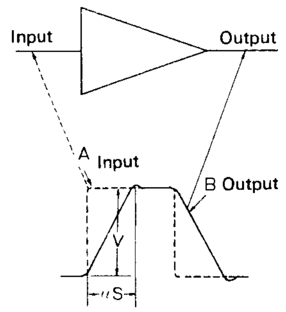


Fig. 12 Input and Output Waveforms Distortion Due to Lack of Slewing Rate

Fig. 13 shows the relationship between the gain of amplifier and frequency. With NF, the band width becomes broad but the slewing rate is reduced.

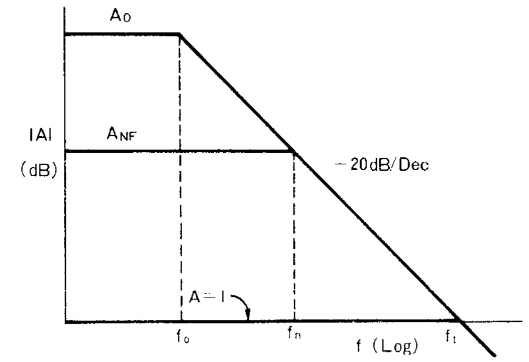


Fig. 13 Band Width Becomes Broad with NF, But.....

When a square wave signal having a quick rise time is applied and the level is increased, the rise time is determined by the freqwency response as explained previously.

Let the maximum inclination at t = 0 be θ, then the slewing rate is:

$\tan\theta = Vm/CR$

If a sine wave signal is applied and the output Vo = Vm sin ωt is obtained, the maximum inclination of the sine wave is:

$dVo/dt = 2\pi f\,Vm$ .... (6)

In this case, the inclination of the output waveform rises sharply up to the cutoff frequency but the amplituded output is reduced at frequencies above the cutoff frequency, thus the waveform is stabilized because it enters the region of slewing rate.

In the L-05M, the cutoff frequency of the maximum amplitude that maintains sine waves is the same as that of small amplitude.

The rise time is practically constant which is tr = 0.35/f. Therefore, from the formula (6), the following is established:

SR = 2.2 Vm/tr .... (7)

Vm is saturated value of output voltage determined by power voltage.

$SR = 2.2 \times 42/0.55$

$= 168V/\mu s$

In the L-05M amplifier, the circuit is designed for high speed operation and the use of high fT power transistors of excellent switching characteristic has improved the slewing rate to $+170V/\mu s$ and $-170V/\mu s$.

It is also possible to improve the slewing rate to 300 or 400V/μs, however, this causes overshoots and ringings in the output waveform. So, it is important to determine the largest possible slewing rate that causes no overshoots and ringings.

The slewing rate is determined mainly by the operating current of the voltage amplifier stage and the phase compensating capacitor.

If the power transistor has poor high frequency characteristic, it is unable to carry a sufficient current to the load at high frequencies, causing a large power loss which leads to the breakdown of the power transistor or affects the proper slewing rate.

CIRCUIT DESCRIPTION

EBT (Emitter Ballast Transistor)

EBT is a combination of small power transistors with stabilizing resistors (ballast resistor) inserted to the emitter. These transistors are excellent in high frequency characteristic and 300 cells are contained in one chip. The emitter and the stabilizing resistor are formed in the same diffusion, providing a wide safe operation range and high cutoff frequency (100 MHz) as compared with the power transistors of the same class (100W).

Features:

(1) The emitter is divided into many sections and each section is provided with a stabilizing resistor, allowing the current to flow evenly over the entire area of the chip and also improving the breakdown strength.

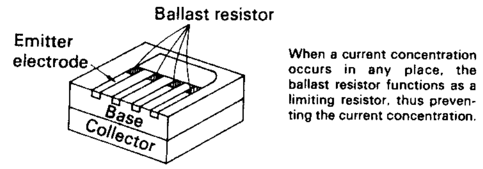


Fig. 14 Emitter with Ballast Resistor

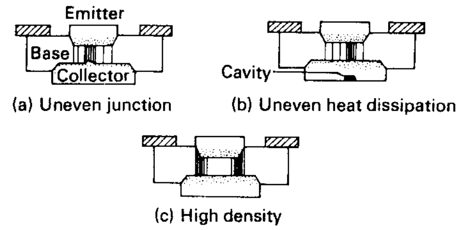


Fig. 15 Cause of Current Concentration

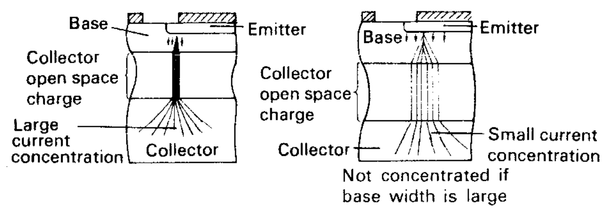


Fig. 16 Base Width, Current Connection and Diffusion Base Type

(2) Spaces for base and collector can be reduced to provide higher cutoff frequency and smaller collector saturation voltage, if the construction breakdown strength is similar to usual ones.

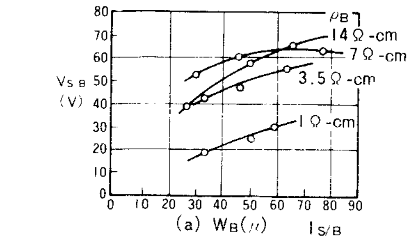
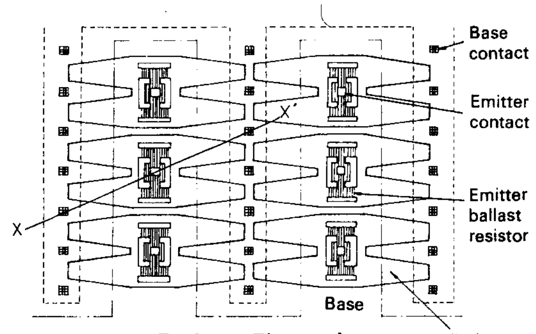


Fig. 17 Base Width and Vs/B (Secondary Breakdown Voltage)

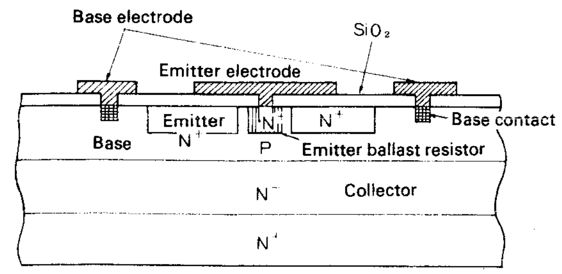
(3) The emitter and emitter stabilizing resistor are arranged for the same diffusion, so the current amplification linearity is excellent at large currents.

(4) Outstanding NPN, PNP complementary characteristic.

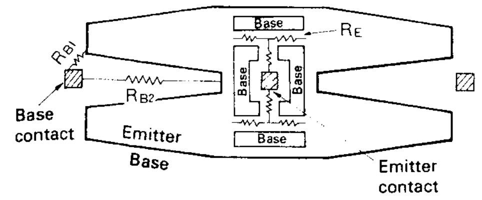
Base Electrode



Emitter Electrode



X-X' Section



Current concentration will not occur between the emitter and base contacts because RB1 is smaller than RB2.

RE and RB of EBT Pattern

Fig. 18 Construction of EBT

CIRCUIT DESCRIPTION

The L-05 amplifier contains differential amplifier, current mirror circuit, constant current circuit and protection circuit. For operating principles of these circuits, refer to the service manual for L-07M, L-07C and KA-8100.

Differential amplifier L-07M
Current mirror circuit L-07C
Constant current circuit L-07M
Protection circuit KA-8100

DESTINATIONS' PARTS LIST

☆ : New Parts

Ref. No.	U.S.A. (K)	Canada (P)	PX (U)	Australia (X)	Europe (W)	Scandinavia (L)	England (T)	South Africa (S)	Other Area (M)	Description
—	A20-1213-03	A20-1213-03	A20-1213-03	A20-1213-03	A20-1213-03	A20-1213-03	A03-1322-03	A03-1213-03	A03-1213-03	Panel ass'y☆
D2	B30-0139-05	B30-0139-05	B30-0139-05	B30-0139-05	B30-0139-05	B30-0151-05	B30-0139-05	B30-0139-05	B30-0139-05	LED☆
—	B46-0061-01	B46-0055-20	B46-0062-10	B46-0064-00	—	—	B46-0060-00	—	—	Warranty card
—	—	—	B46-0063-00	—	—	—	—	—	—	Warranty card
—	B50-1672-00	B50-1673-00	B50-1672-00	B50-1672-00	B50-1672-00	B50-1672-00	B50-1674-00	B50-1672-00	B50-1673-00	Instruction manual☆
—	—	—	B59-0018-00	—	—	—	—	—	—	KENWOOD service stations' list
—	—	—	D32-0081-04	D32-0081-04	D32-0081-04	D32-0081-04	—	D32-0081-04	D32-0081-04	Switch stopper
—	E03-0008-05	E03-0008-05	—	—	—	—	—	—	—	AC outlet
—	E30-0181-05	E30-0181-05	E30-0515-05	E30-0185-05	E30-0580-05	E30-0292-05	E30-0602-05	B30-0602-05	E30-0515-05	Power Cord
—	E30-0600-15	E30-0595-15	E30-0595-15	E30-0595-15	E30-0595-15	E30-0595-15	E30-0595-15	E30-0595-15	E30-0595-15	Speaker cord
—	H01-1784-04	H01-1785-04	H01-1784-04	H01-1784-04	H01-1784-04	H01-1784-04	H01-1787-04	H01-1784-04	H01-1784-04	Carton box☆
—	J02-0073-04	J02-0049-14	J02-0049-14	J02-0049-14	J02-0049-14	J02-0049-14	J02-0049-14	J02-0049-14	J02-0049-14	Foot
—	J41-0034-05	J41-0034-05	J41-0033-05	J41-0024-15	J41-0033-05	J41-0033-05	J41-0024-15	J41-0024-15	J41-0033-05	Cord bushing
—	L01-1431-05	L01-1431-05	L01-1435-05	L01-1435-05	L01-1436-05	L01-1436-05	L01-1437-05	L01-1435-05	L01-1435-05	Power transformer☆
—	L01-1521-05	L01-1521-05	L01-1526-05	L01-1526-05	L01-1526-05	L01-1526-05	L01-1526-05	L01-1526-05	L01-1526-05	Remote control power transformer☆
S2	—	—	S31-3004-05	S31-3004-05	S31-3004-05	S31-3004-05	—	S31-3004-05	S31-3004-05	Slide switch (power voltage selector)
—	X07-1590-11	X07-1590-11	X07-1590-00	X07-1590-00	X07-1590-61	X07-1590-61	X07-1590-61	X07-1590-00	X07-1590-00	Power amp PC board ass'y☆
—	X13-2530-11	X13-2530-11	X13-2530-21	X13-2530-21	X13-2530-61	X13-2531-71	X13-2530-61	X13-2530-21	X13-2530-21	Remote control PC board ass'y☆

PARTS LIST

RS: Metal film resistor
RD: Carbon film resistor

☆: New Parts

Ref. No.	Parts No.	Description	Remarks
		CAPACITORS	
C1	C90-0362-05	Electrolytic 12000μF 79VS	☆
		SEMICONDUCTOR	
Q1,2	V03-2337-00	Transistor 2SC2337	☆
Q3,4	V01-1007-00	Transistor 2SA1007	☆
D1	V11-5100-10	Varistor STV-4H(W)	
		SWITCH	
S3	S44-2022-05	Toggle (REMOVE)	
		MISCELLANEOUS	
—	A01-0345-03	Case	
—	B07-0111-04	Ring	☆
—	B42-0009-04	Passed sticker	
—	E02-0209-05	Transistor socket × 4	
—	E03-0006-05	Remote jack	
—	E13-0115-15	Phono jack with lock	
—	E21-0004-15	Binding post (RED)	
—	E21-0005-15	Binding post (BLK)	
—	E21-0007-05	Binding post (GND)	☆
—	E30-0594-05	Remote cord ass'y	
—	H10-1510-02	Polystyrene foamed fixture (R)	☆
—	H10-1511-02	Polystyrene foamed fixture (L)	☆
—	H25-0078-00	Instruction bag × 2	
—	J19-0509-04	LED holder	
—	J25-1534-14	Power line PC board	☆
—	K29-0292-04	Knob	☆

POWER AMP (X07-1590-11)

Ref. No.	Parts No.	Description	Remarks
		CAPACITOR	
Ce1	CC45SL1H470K	Ceramic 47pF ±10%	
Ce2	CC45SL1H101K	Ceramic 100pF ±10%	
Ce3	CE04W1V101EL	Electrolytic 100μF 35WV	
Ce4	CK45B1H821K	Ceramic 820pF ±10%	
Ce5	CC45SL1H030D	Ceramic 3pF ±0.5pF	
Ce6	CE04W0J471JL	Electrolytic 470μF 6.3WV	
Ce7	CC45SL1H470K	Ceramic 47pF ±10%	
Ce8	CE04W2A101EL	Electrolytic 100μF 100WV	
Ce9	CC45SL1H470K	Ceramic 47pF ±10%	
Ce10	CC45SL1H330K	Ceramic 33pF ±10%	
Ce11,12	CE04W2A101EL	Electrolytic 100μF 100WV	
Ce13	CE04W1H010EL	Electrolytic 1μF 50WV	
Ce14	CC45SL1H080D	Ceramic 8pF ±0.5pF	
Ce15	CC45SL1H020D	Ceramic 2pF ±0.5pF	
Ce16	CQ93M1H103M	Mylar 0.01μF ±20%	
Ce17	CC45SL1H271K	Ceramic 270pF ±10%	
Ce18	CE04W1A470EL	Electrolytic 47μF 10WV	
Ce19	CC45SL1H120K	Ceramic 12pF ±10%	
Ce20,21	CE04W1E100EL	Electrolytic 10μF 25WV	
Ce22	CE04W1A470EL	Electrolytic 47μF 10WV	
Ce23	CE04W1C470EL	Electrolytic 47μF 16WV	
Ce27,28	CK45E2H103P	Ceramic 0.01μF +100%−0%	
Ce29	CE04W1H100EL	Electrolytic 10μF 50WV	
Ce30,31	CE04W1C101EL	Electrolytic 100μF 16WV	
Ce32	CE04AW1E470EL	Electrolytic 47μF 25WV	
Ce33	CQ93M1H473M	Mylar 0.047μF ±20%	

Ref. No.	Parts No.	Description	Remarks
		RESISTOR	
Re7,8	RD14GY2E101JMA	Flame proof RD 100Ω ±5% 1/4W	
Re10	RD14GY2E391JMA	Flame proof RD 390Ω ±5% 1/4W	
Re11	RS14GB3A332JMA	Flame proof RS 3.3kΩ ±5% 1W	
Re12,13	RD14GY2E911JMA	Flame proof RD 910Ω ±5% 1/4W	
Re17	RD14GY2E101JMA	Flame proof RD 100Ω ±5% 1/4W	
Re18	RS14GB3A682JMA	Flame proof RS 6.8kΩ ±5% 1W	
Re19,20	RD14GY2E221JMA	Flame proof RD 220Ω ±5% 1/4W	
Re21,22	RD14GY2E270JMA	Flame proof RD 27Ω ±5% 1/4W	
Re23,24	RN92BC2E223F	Metal film 22kΩ ±1% 1/4W	
Re25	RD14GY2E390JMA	Flame proof RD 39Ω ±5% 1/4W	
Re30,32	RD14GY2E620JMA	Flame proof RD 62Ω ±5% 1/4W	
Re33～36	R92-0111-05	Metal film 0.47Ω ±5% 3W	
Re37～40	RD14GY2E4R7JMA	Flame proof RD 4.7Ω ±5% 1/4W	
Re44	RS14GB3A102JMA	Flame proof RS 1kΩ ±5% 1W	
Re45	RS14GB3A272JMA	Flame proof RS 2.7kΩ ±5% 1W	
Re46	RS14GB3A472JMA	Flame proof RS 4.7kΩ ±5% 1W	
Re54,55	RS14GB3D471JMA	Flame proof RS 470Ω ±5% 2W	
Re57	RS14GB3A4R7JMA	Flame proof RS 4.7Ω ±5% 1W	
Re58,59	RS14FB3F100JMA	Flame proof RS 10Ω ±5% 3W	
		SEMICONDUCTOR	
Qe1	V09-0129-10	Dual FET 2SK109(D), (E)	☆
Qe2～4	V03-0500-05	Transistor 2SC1775(E), (F)	
Qe5,6	V01-0199-05	Transistor 2SA899(B), (V)	
Qe7	V03-0460-05	Transistor 2SC1904(B), (V)	
Qe8	V01-0191-05	Transistor 2SA872(D), (E)	
Qe9,10	V03-0500-05	Transistor 2SC1775(E), (F)	
Qe11	V01-0191-05	Transistor 2SA872(D), (E)	
Qe12	V03-0408-05	Transistor 2SC1913(Q), (R)	
Qe13	V01-0188-05	Transistor 2SA913(Q), (R)	
Qe14	V03-0408-05	Transistor 2SC1222(E), (U)	
Qe15	V03-0424-05	Transistor 2SC1400(E), (U)	
Qe16	V03-0452-05	Transistor 2SC1735(D), (E)	
De1	V11-0435-05	Zener diode EQA01-24R	
De2～4	V11-0271-05	Diode 1S2076	
De7,8	V11-0273-05	Diode 1S2076A	
De9	V11-0271-05	Diode 1S2076	
De10～13	V11-7100-40	Diode ERD03-02H	☆
De14,15	V11-0295-05	Diode W06B	
De16	V11-0273-05	Diode 1S2076A	
De17～20	V11-0271-05	Diode 1S2076	
De21	V11-0295-05	Diode W06B	
		COIL	
Le1	L40-1001-05	Phase compensation	
Le2,3	L39-0082-05	Ferri-inductor	☆
		POTENTIOMETER	
VR31,2	R12-0502-05	Trimming metal glase 100Ω(B) OFFSET, BIAS	
		RELAY	
RLe1	S51-4030-05	Relay (24V)	
		MISCELLANEOUS	
Fe1,2	F05-5022-05	Fuse (5A) (X07-1590-00)	
	F05-5021-05	Fuse (5A) (X07-1590-11)	
	F05-5024-05	Fuse (5A) (X07-1590-61)	
	J13-0041-05	Fuse clip × 4 (X07-1590-11)	
	J13-0054-05	Fuse clip × 4	

PARTS LIST

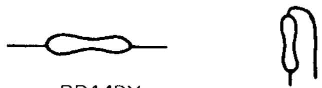
REMOTE CONTROL (X13-2530-11)

Ref. No.	Parts No.	Description	Re-marks
		CAPACITOR	
Ch1	CE04W1C102EL	Electrolytic 1000μF 16WV	
Ch2,3	C91-0025-05	Film 0.01μF AC 125V (X13-2530-11)	
	C91-0023-05	Film 0.01μF AC 125V (X13-2530-21)	
	CK45E3D103PMU	Ceramic 0.01μF DC 2kV (X13-2530-61, -2531-71)	
Ch4	C91-0310-05	Metal film 0.1μF 1000V (X13-2530-21)	
	C90-0151-05	Metal film 0.047μF 250V (X13-2530-61, -2531-71)	
Ch5	C91-0025-05	Film 0.01μF AC 125V (X13-2530-11)	
	C91-0023-05	Film 0.01μF AC 125V (X13-2530-21)	
Ch5,6	CK45E3D103PMU	Ceramic 0.01μF DC 2kV (X13-2530-61, -2531-71)	
		SEMICONDUCTOR	
Qh1	V01-0130-05	Transistor 2SA684(Q), (R)	
Dh1	V11-0271-05	Diode 1S2076	
Dh2～6	V11-0295-05	Diode W06B	
		SWITCH/RELAY	
S1	S40-2085-05	Pushbutton (POWER) (X13-2530-11)	
	S40-2074-05	Pushbutton (POWER) (X13-2530-21)	
	S40-2075-05	Pushbutton (POWER) (X13-2530-61, -2531-71)	
		RELAY	
RL1	S51-1023-05	Relay	☆
		MISCELLANEOUS	
F1	F05-3014-05	Fuse (0.3A) (X13-2530-11)	
	F05-3011-05	Fuse (0.3A) (X13-2530-21)	
	F05-3112-05	Fuse (315mA) (X13-2530-61, -2531-71)	
—	J13-0055-05	Fuse clip × 2	

NOTE: PC board ass'y numbered X13-2531-71 is provided with Rh3.

Note:
Resistors except the special type (example: cement, metal film, etc.) are not detailed in PARTS LIST. With regard to the value, refer to the schematic diagram or the PC board illustration.
Resistors not detailed are carbon type (1/4W or 1/8W).
You should give an order for the carbon resistors according to the ways described as follows:
A carbon resistor's part number is example RD14BY 2E 222J

1. Kinds of the carbon resistor



RD14BY RD14CY

2. Wattage

1/4W → 2E
1/8W → 2B

3. Resistance value

$\underbrace{(2)\ (2)}_{\text{Significant figure}}\ \underbrace{(2)}_{\text{Multiplier}}$ → means 22 X 10^2 = 2200Ω (2.2kΩ)

Example:

221 → 220Ω
222 → 2.2kΩ
223 → 22kΩ
224 → 220kΩ
225 → 2.2MΩ

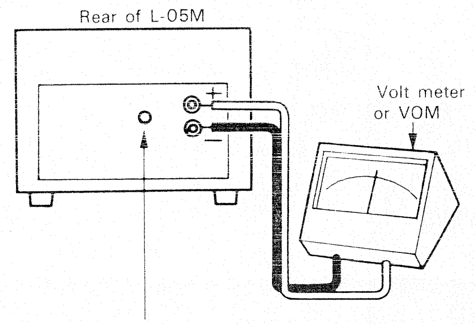
4. Tolerance

J = ±5% (Gold color)
K = ±10% (Silver color)

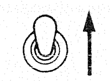
ADJUSTMENT

OFFSET ADJUSTMENT

①



②



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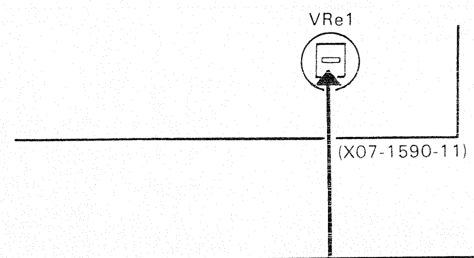
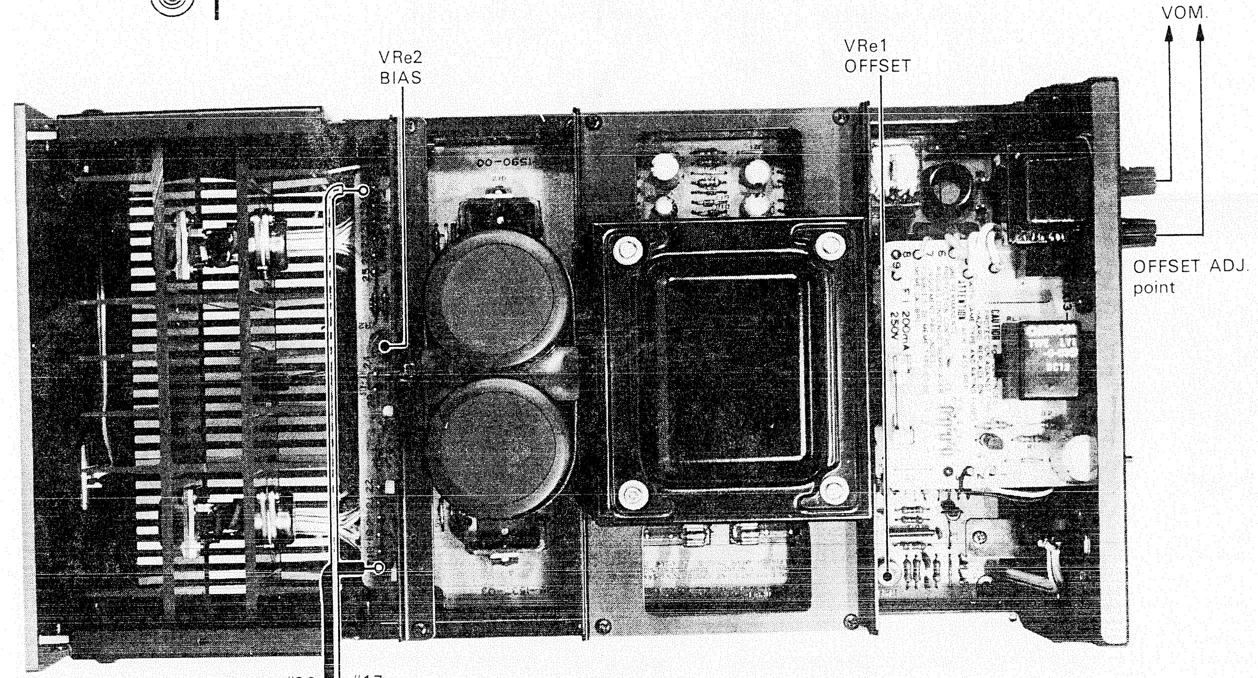


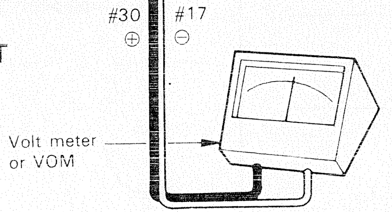
Turn the trimming potentiometer VRe1 until the volt meter or VOM indicates 0V.

Note: If the output terminal has DC voltage more than specified value, protection circuit works. Whenever adjusting OFFSET, check whether the relay works or not.

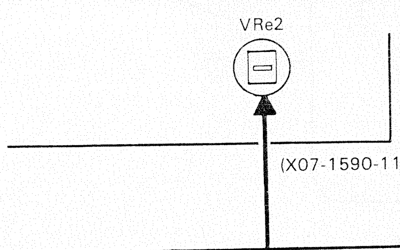


BIAS CURRENT

①



②

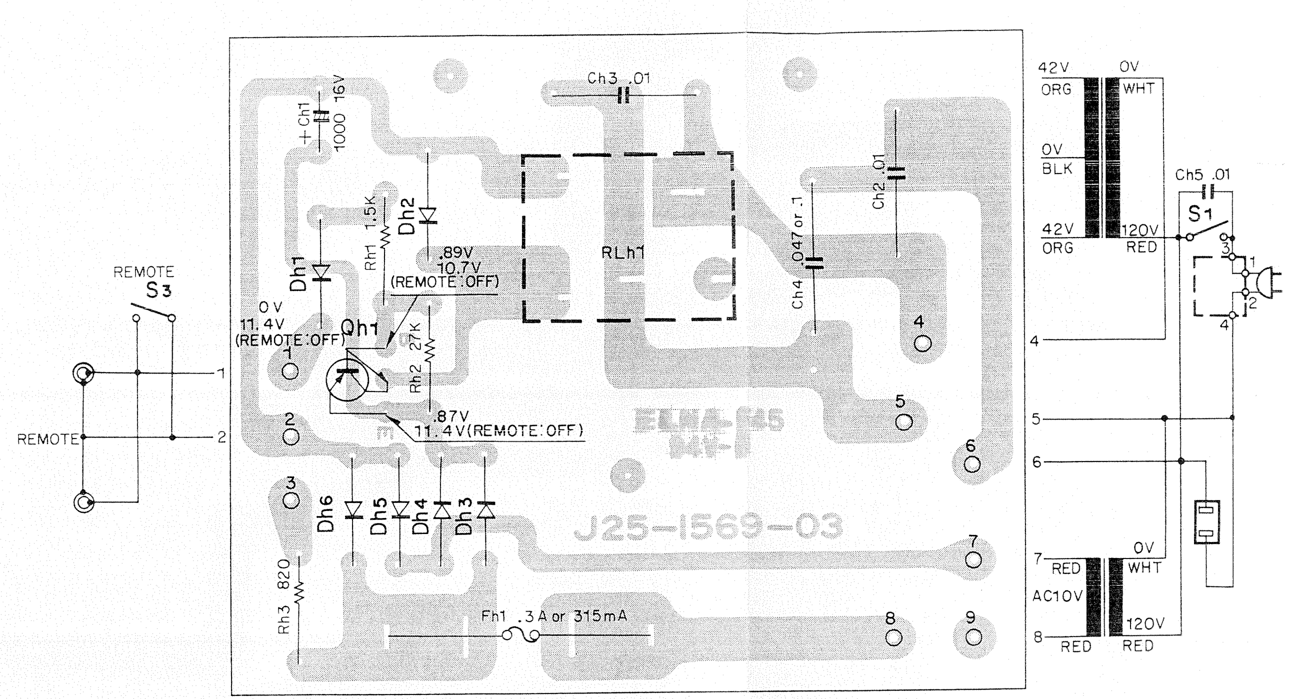


Turn the trimming potentiometer VRe2 until the meter indicates 18mV.

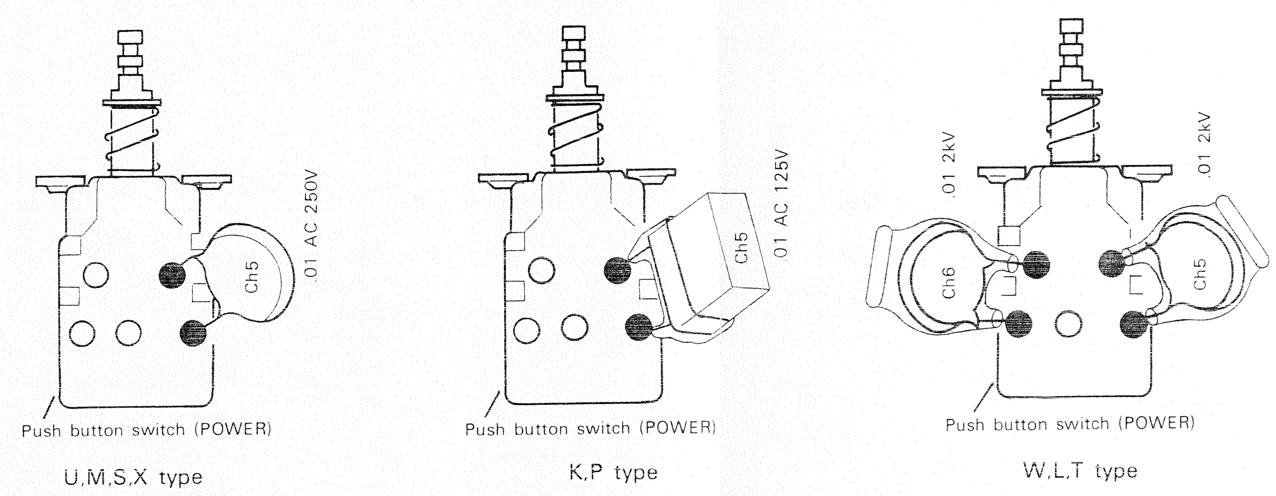
PC BOARD

Note: Only PC board ass'y numbered X13-2531-71 is provided with Rh3.
Measured DC voltage is across #2 of X13-2530-11.

▼ REMOTE (X13-2530-11)



Qh1: 2SA684(Q)or(R), Dh1: 1S2076, Dh2~6: W06B



Installation of Ch5 and Ch6

ABSOLUTE MAX. RATINGS

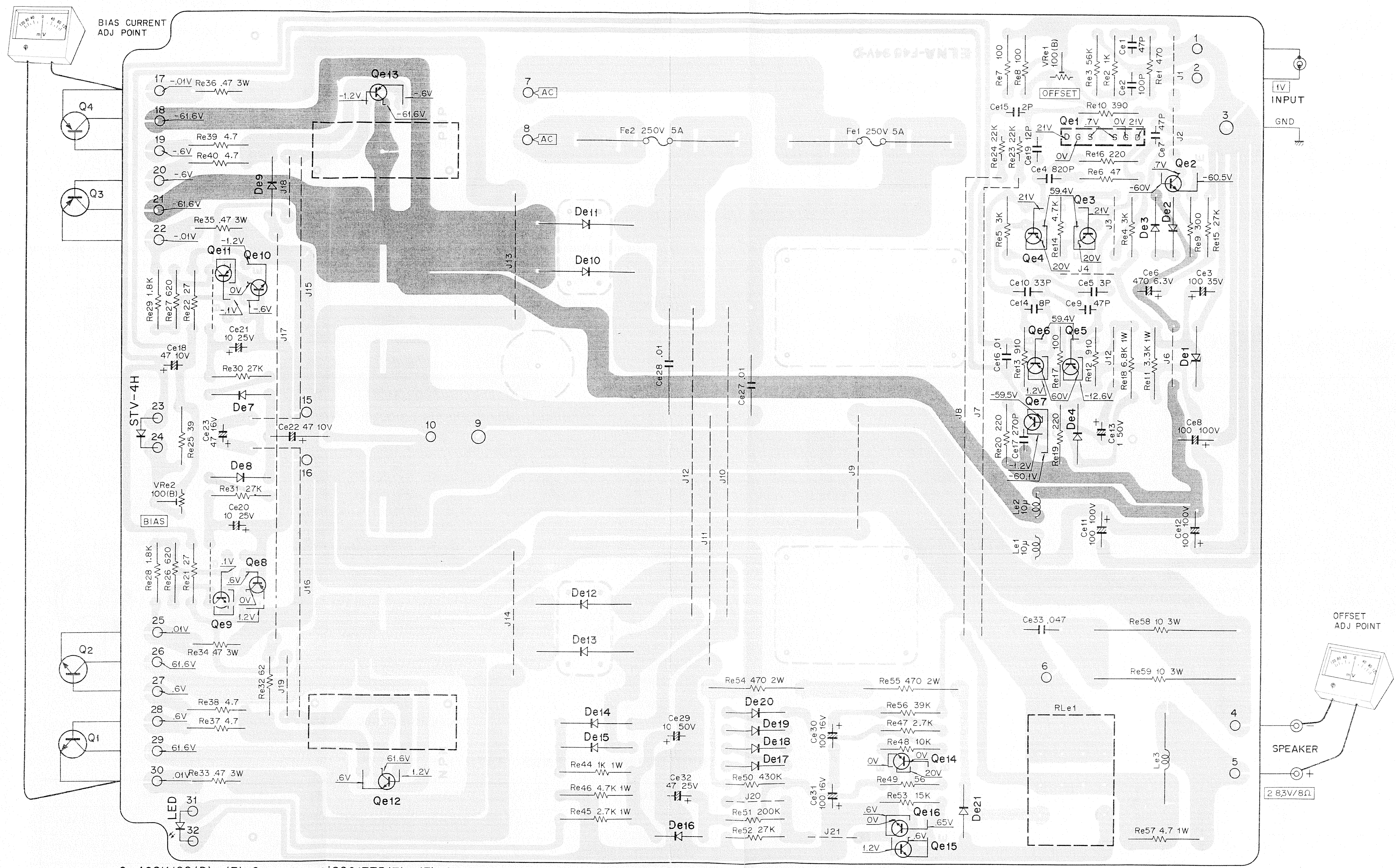
TRANSISTOR	VCBO	VEBO	VCEO	IC	PT	Tj	Tstg	fT
2SA1007	−150V	−4.5V	−130V	−10A	4W (Ta=24°C) 100W (Tc=25°C)	150°C	−65~+150°C	50 MHz
2SC2337	150V	4.5V	130V	10A	5W (Ta=25°C) 100W (Tc=25°C)	150°C	−65~+150°C	70 MHz
FET	VGDO	ID	PT	Tch				
2SK109	−50V	20 mA	150 mW	+125°C				

L-05M L-05M

PC BOARD

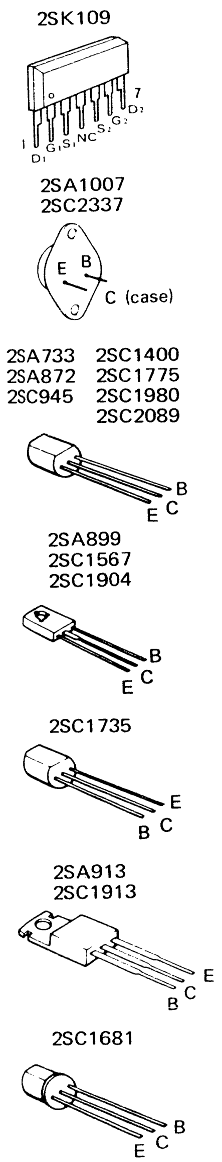
– Vcc   + Vcc

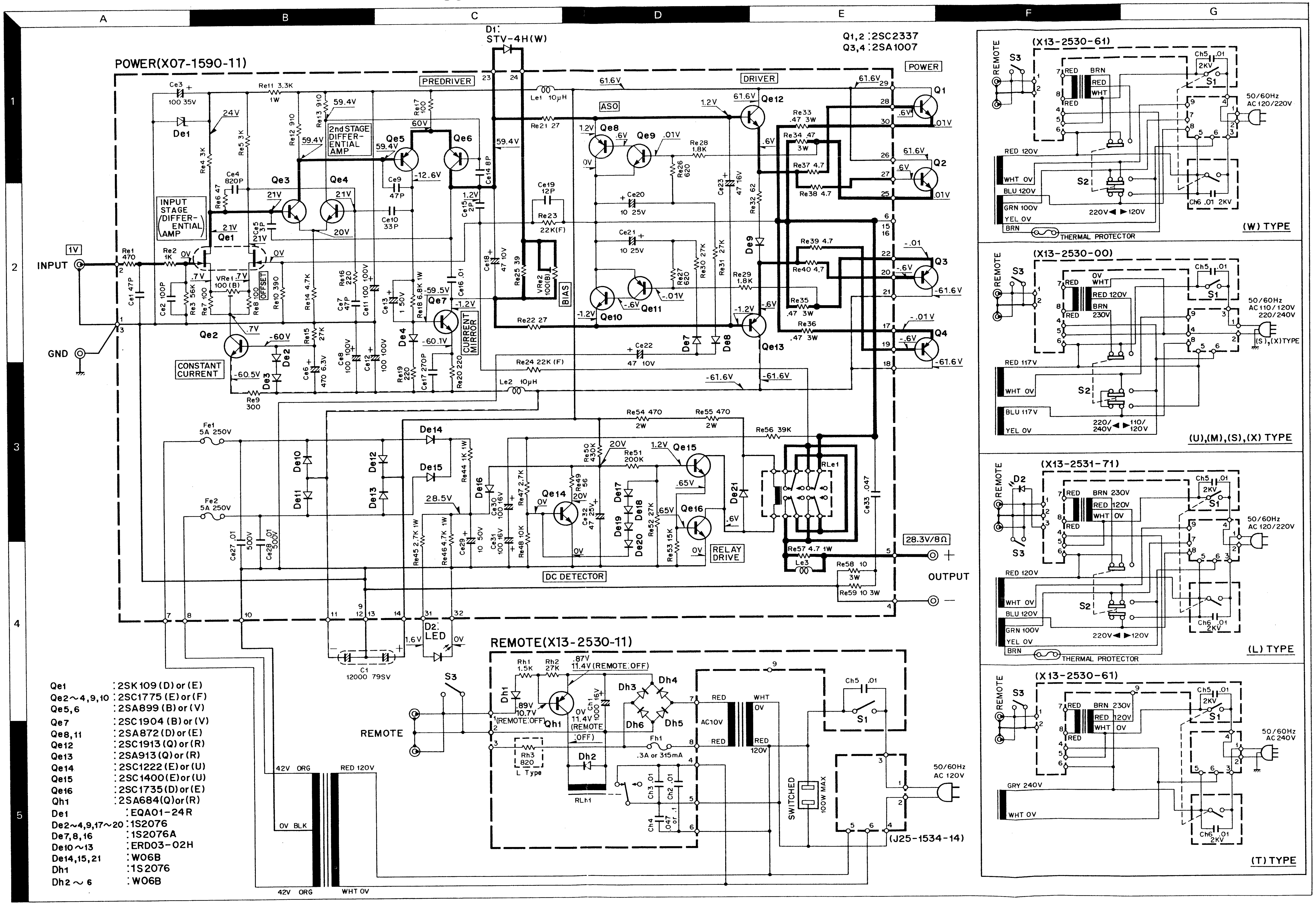
▼ POWER AMP (X07-1590-11)



Qe1:2SK109(D)or(E), Qe2~4,9,10:2SC1775(E)or(F), Qe5,6:2SA899(B)or(V), Qe7:2SC1904(B)or(V), Qe8,11:2SA872(D)or(E), Qe12:2SC1913(Q)or(R), Qe13:2SA913(Q)or(R)
Qe14:2SC1222(E)or(U), Qe15:2SC1400(E)or(U), Qe16:2SC1735(D)or(E), De1:EQA01-24R, De2~4,9,17~20:1S2076, De7,8,16:1S2076A, De10~13:ERD03-02H, De14,15,21:W06B

SCHEMATIC DIAGRAM





Semiconductor	Substitutions
2SA1007	—
2SC2337	—
2SA872(D),(E)	Qe8,11 (limitter) = 2SA733
2SA899(B),(V)	—
2SC1222(E),(U)	2SC1775, 2SC1681 2SC1400, 2SC2089 2SC1980 or (VCEO ≧ 60V)
2SC1400(E),(U)	2SC1775, 2SC1980, 2SC2089 or VCEO ≧ 80V, ICBO: Small hFE: High
2SC1735(D),(E)	2SC1567 or VCEO ≧ 80V Ic > 100mA
2SC1775(E),(F)	Qe9,10 (limitter) = 2SC945
SC1904(B),(V)	—
2SC1913(Q),(R)	—
2SK109(D),(E)	—

In the case of using the substitutive semiconductor, you should confirm the leads of one.

NOTE:

1. Resistor values are indicated in ohm (K: 1000-ohms, M: 1000k ohms). Non specified resistors are 1/4W, and ±5%.
2. Capacitor values are in μF (1P = μμF = pF = 10^{-12} × F, μF 10^{-6} × F) Non specified capacitors are 50WV.
3. Inductance values are in Henry.
4. DC voltages are measured with 20kΩ/V VOM at no signal between GND.
5. DC voltage of REMOTE PC board ass'y is measured between #2 of X13-2530-11.

SPECIFICATIONS

Specifications described here are based on the measurement using the special speaker cable with length of one meter provided.

PERFORMANCE

100 watts* minimum RMS at 8 ohms, from 20 Hz to 20,000 Hz with no more than 0.005% total harmonic distortion.

Continuous Power	
8 ohms at 1,000 Hz	100 watts
4 ohms at 1,000 Hz	150 Watts
Total Harmonic Distortion	
10 Hz ~ 100 kHz, 8 ohms at rated power	0.06%
20 Hz ~ 20 kHz, 8 ohms at rated power	0.005%
20 Hz ~ 20 kHz, 8 ohms at 1/10 rated power	0.0035%
1 kHz, 8 ohms at rated power	0.0015%
1 kHz, 4 ohms at rated power	0.004%
Intermodulation Distrotion (60 Hz : 7 kHz = 4 : 1)	
8 ohms at rated power	0.001%
8 ohms at 1/10 rated power	0.001%
4 ohms at rated power	0.03%
Frequency Response	DC~600 kHz +0, −3 dB
Signal to Noise Ratio (short-circuited)	120 dB
Damping Factor	
DC~20 kHz, 8 ohms	150
DC~20 kHz, 8 ohms without speaker cable	200
DC~80 kHz, 8 ohms without speaker cable	100
Input Sensitivity/Impedance	1V/50k ohms
Transient Response	
Rise Time −1V ⇄ +1V	0.55μS
−20V ⇄ +20V	0.55μS
−40V ⇄ +40V	0.55μS
Slew Rate	±170V/μS
Speaker Impedance	Accept 4 ohms to 16 ohms speaker impedance
Speaker Cable Loss	0.01 ohm

GENERAL

Power Requirements	60 Hz 120V (U.S.A. and CANADA Model) or 50/60 Hz 110-120V/220-240V
Power Consumption at full power	600 watts
at non-signal	30 watts
AC Outlet	1 UNSWITCHED
Dimensions	W: 7-7/8" (200mm) H: 6-3/32" (155 mm) D: 15-11/32" (390mm)
Weight	Net 19.2 lbs (8.7 kg) Gross 21.6 lbs (9.8 kg)

* Measured pursuant to Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifier in U.S.A.

Note:
Kenwood follows a policy of continuous adavancements in development. For this reason specifications may be changed without notice.

A product of
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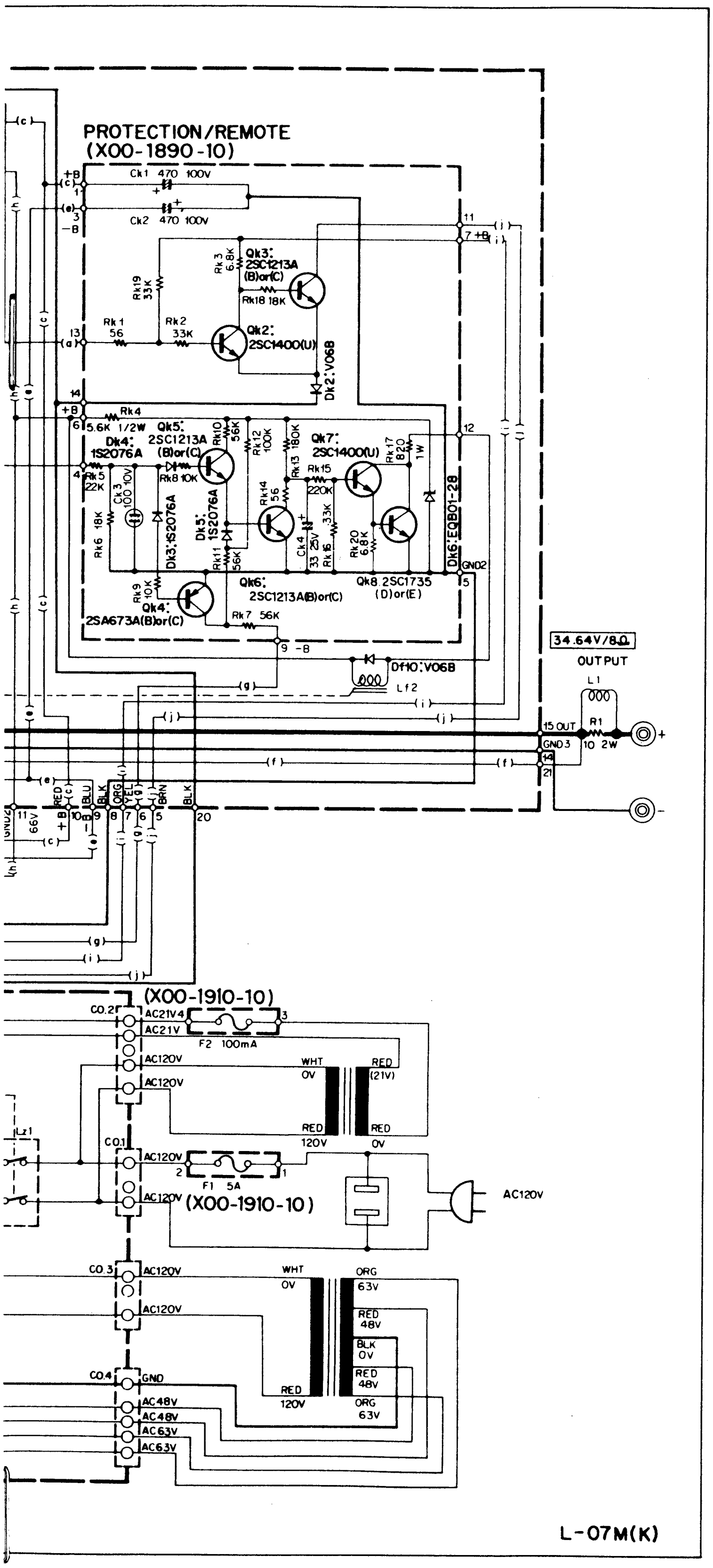
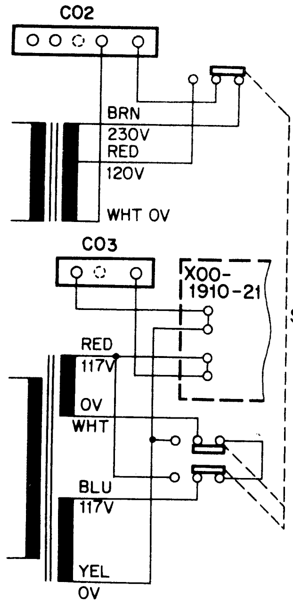
C DIAGRAM



REVISED CIRCUITS

(M) TYPE



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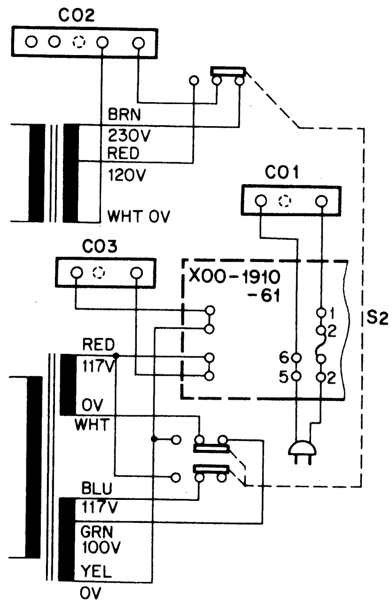

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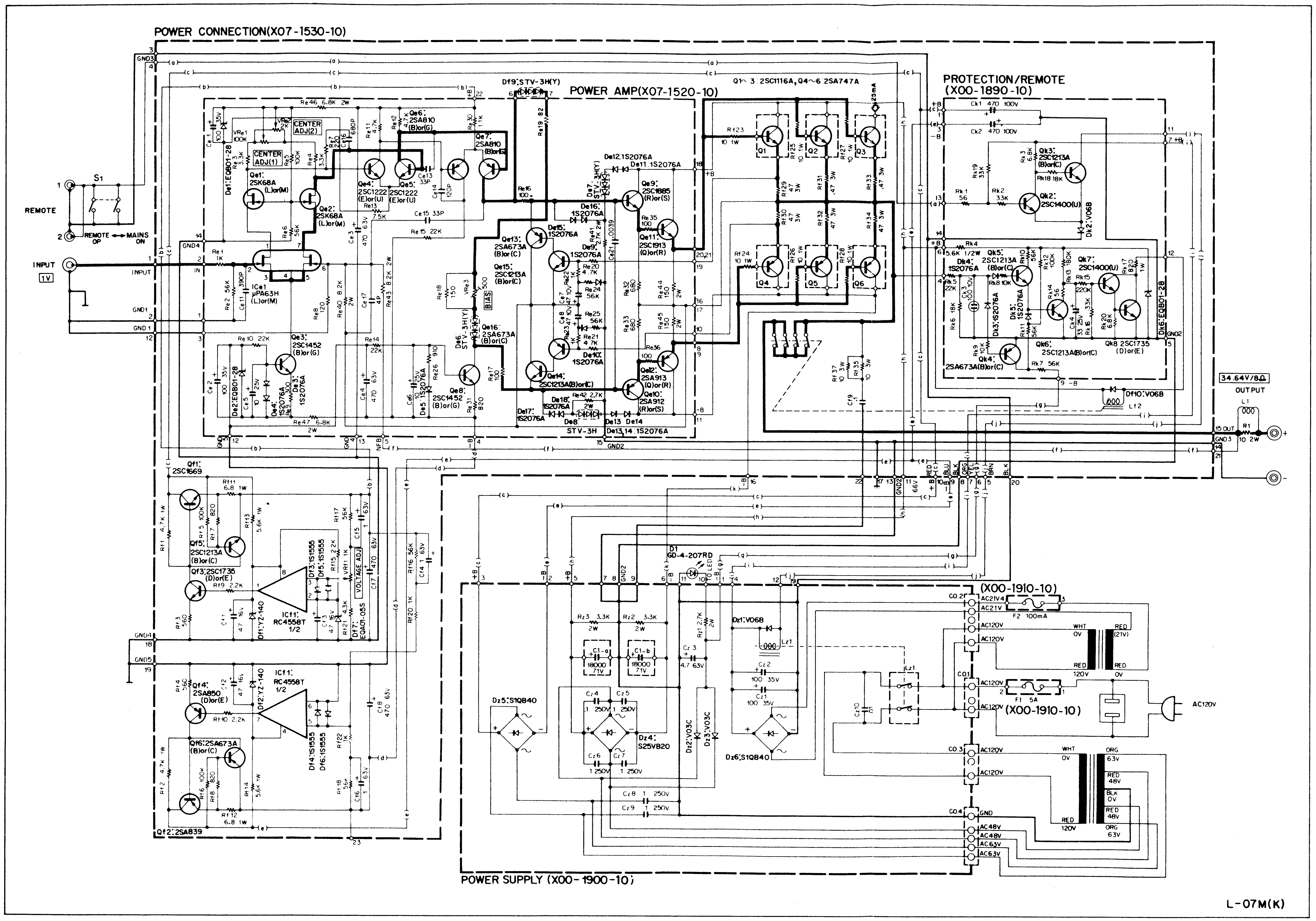
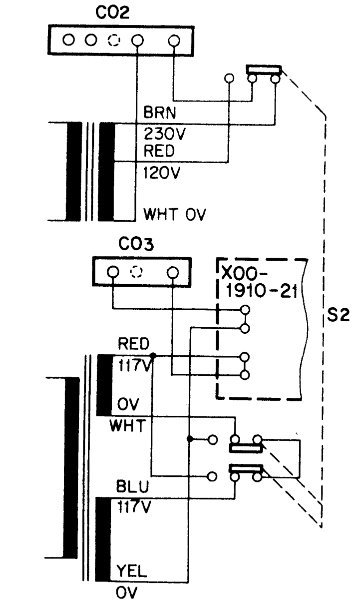
L-07M SCHEMATIC DIAGRAM

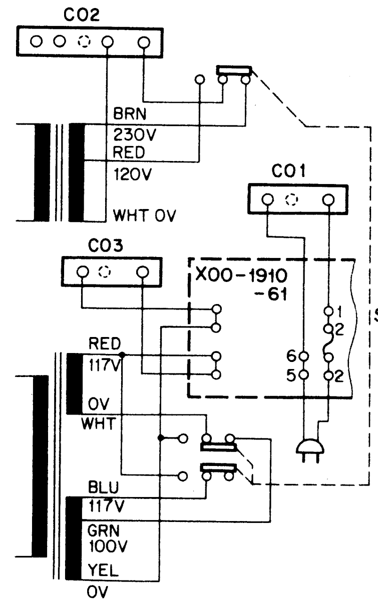


REVISED CIRCUITS

(M) TYPE



(W) TYPE



NOTE: We reserve the right to make modifications in this model in accordance with technical developments.

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